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Meiser et al.

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(54) **METHOD OF FORMING SHEET METAL CASKET SHELL**

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(73) Assignee: **Batesville Services, Inc.**, Batesville, IN (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1192 days.

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(74) *Attorney, Agent, or Firm* — Wood, Herron & Evans, LLP

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(57) **ABSTRACT**

(58) **Field of Classification Search**
CPC B21D 17/04; B21D 22/14; B21D 31/005; B21D 51/2646; B21D 51/52
USPC 72/31.06, 51, 67, 75, 112, 115, 117, 72/124, 210, 211, 214, 215, 218, 220, 72/367.1, 368, 370.21
See application file for complete search history.

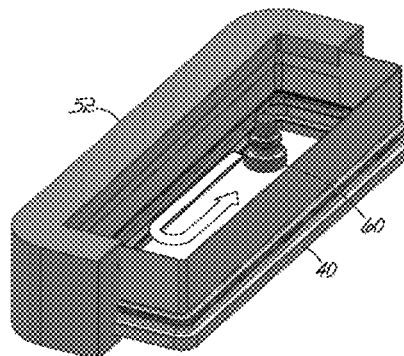
A method of forming a pair of opposed side walls and a pair of opposed end walls of a sheet metal casket shell from a single piece of sheet metal. The piece of sheet metal has opposite ends and a length equal to the combined length of the pair of side walls and the pair of end walls of the casket shell to be formed. The opposite ends of the piece of sheet metal are secured together to form a tube. A roll forming roller is positioned in an interior of the tube. A female die configured to produce a desired profile for the side walls and the end walls of the casket shell is positioned around an exterior of the tube. The roller is moved outwardly so as to contact an interior surface of the tube and deform the tube toward a die cavity of the female die. The roller is rolled around a perimeter of the interior of the tube so as to deform the perimeter of the tube toward the die cavity of the female die. The desired profile for the side walls and the end walls of the casket shell is thereby produced.

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31 Claims, 12 Drawing Sheets



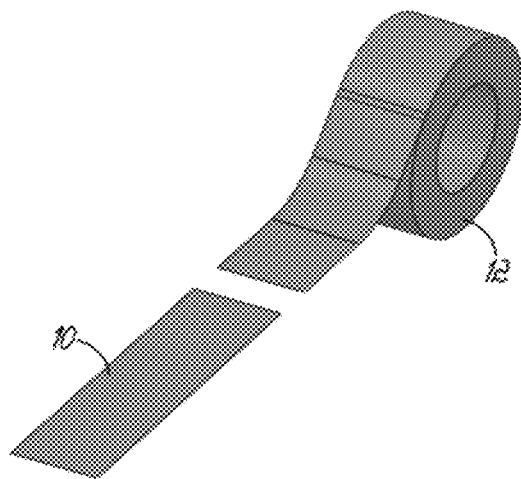
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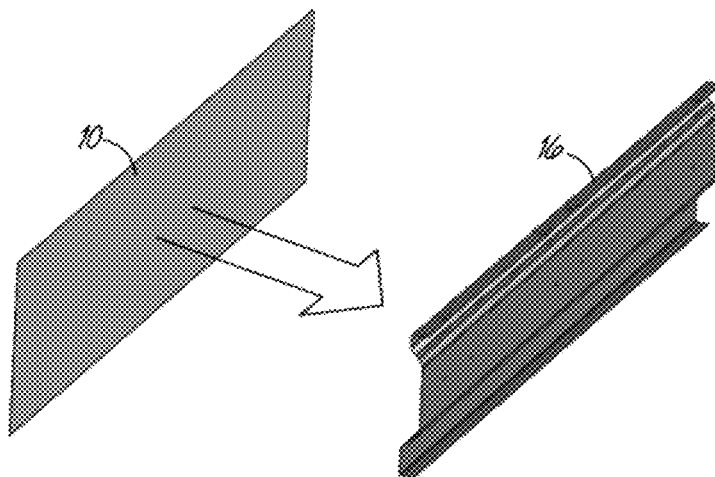
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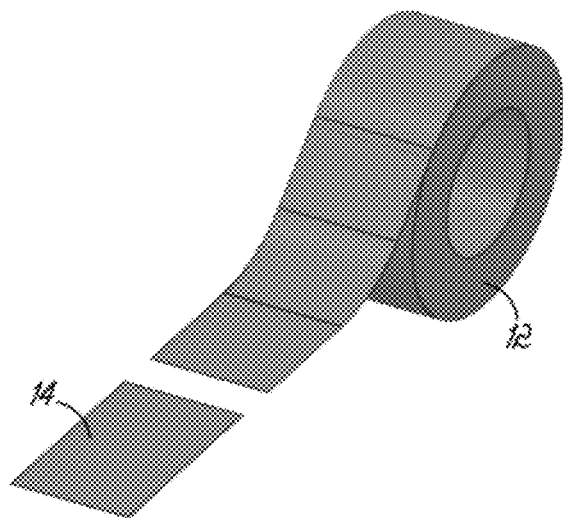
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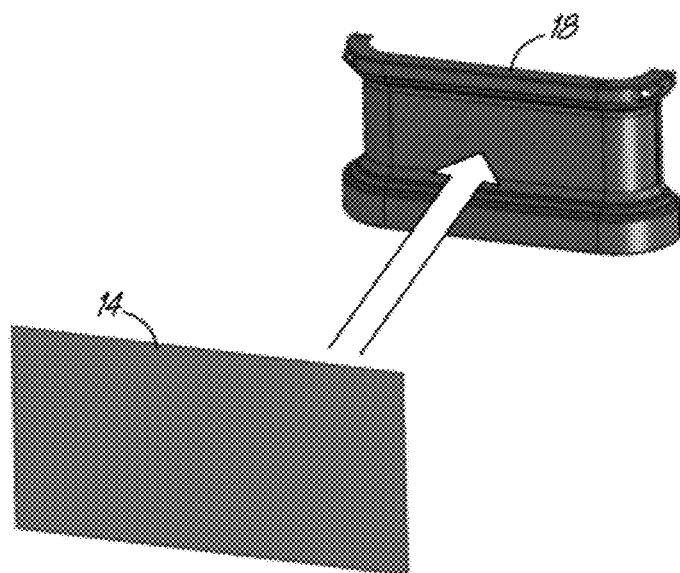
PRIOR ART
FIG. 1



PRIOR ART
FIG. 2



PRIOR ART
FIG. 3



PRIOR ART
FIG. 4

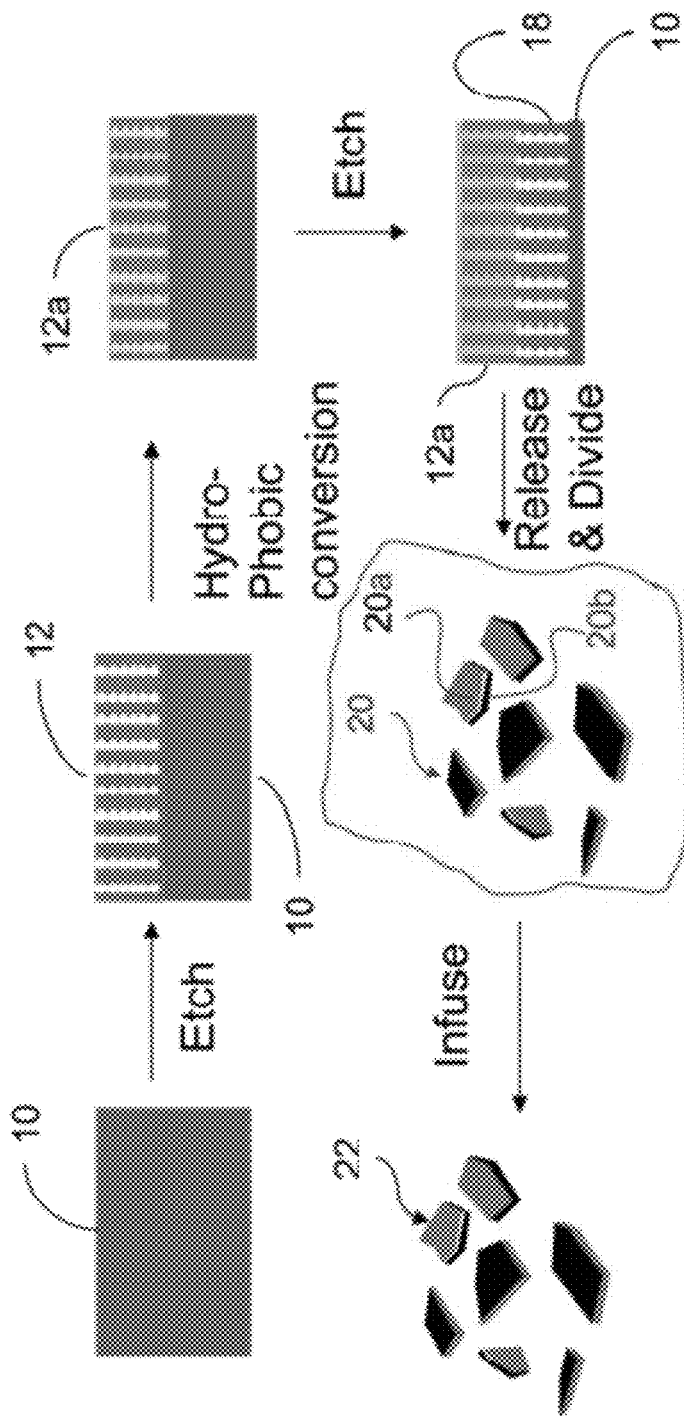
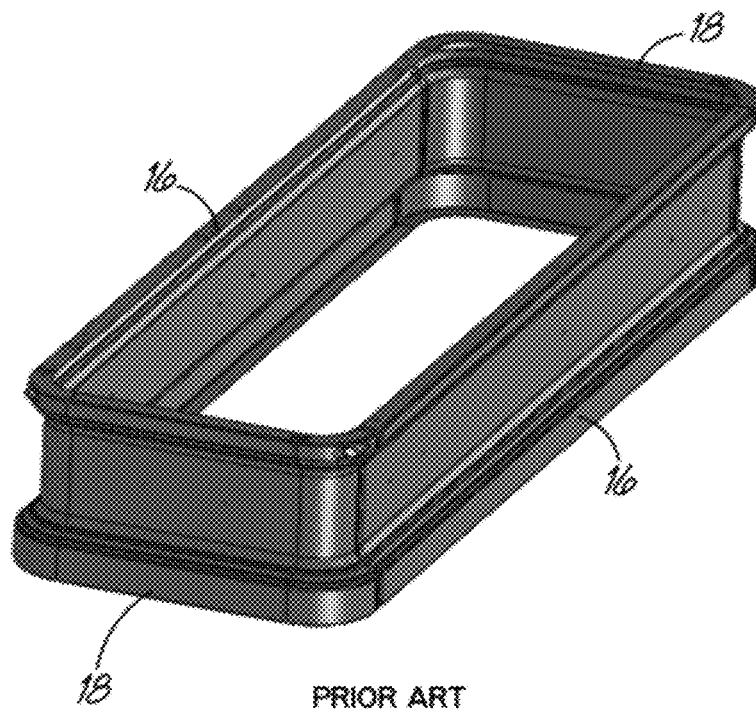
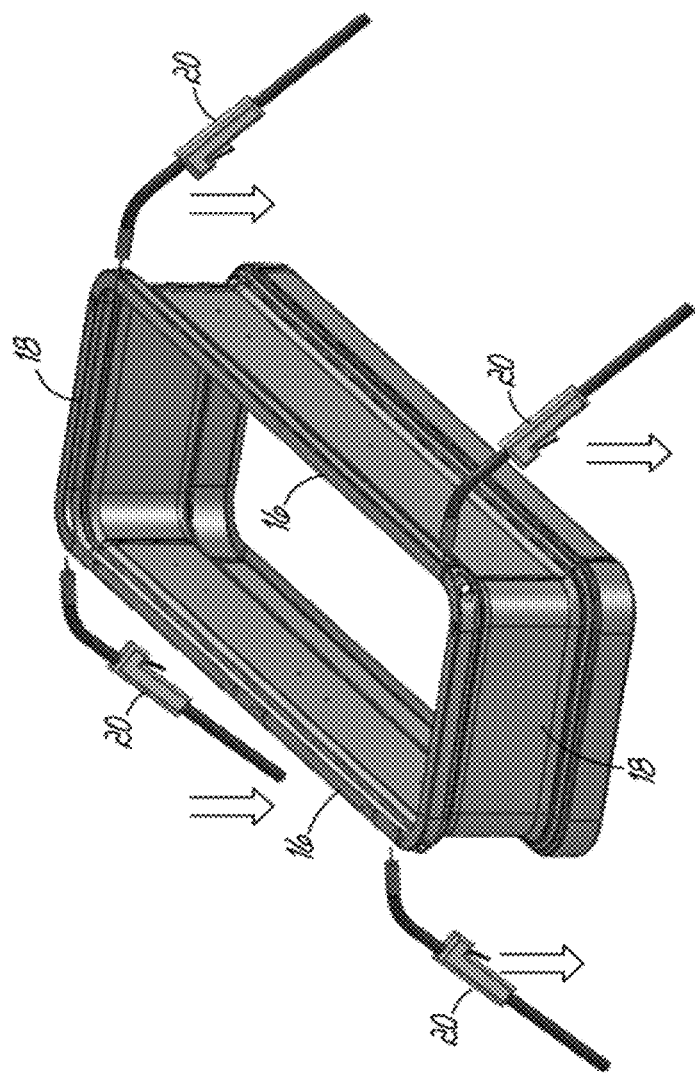


FIG. 5

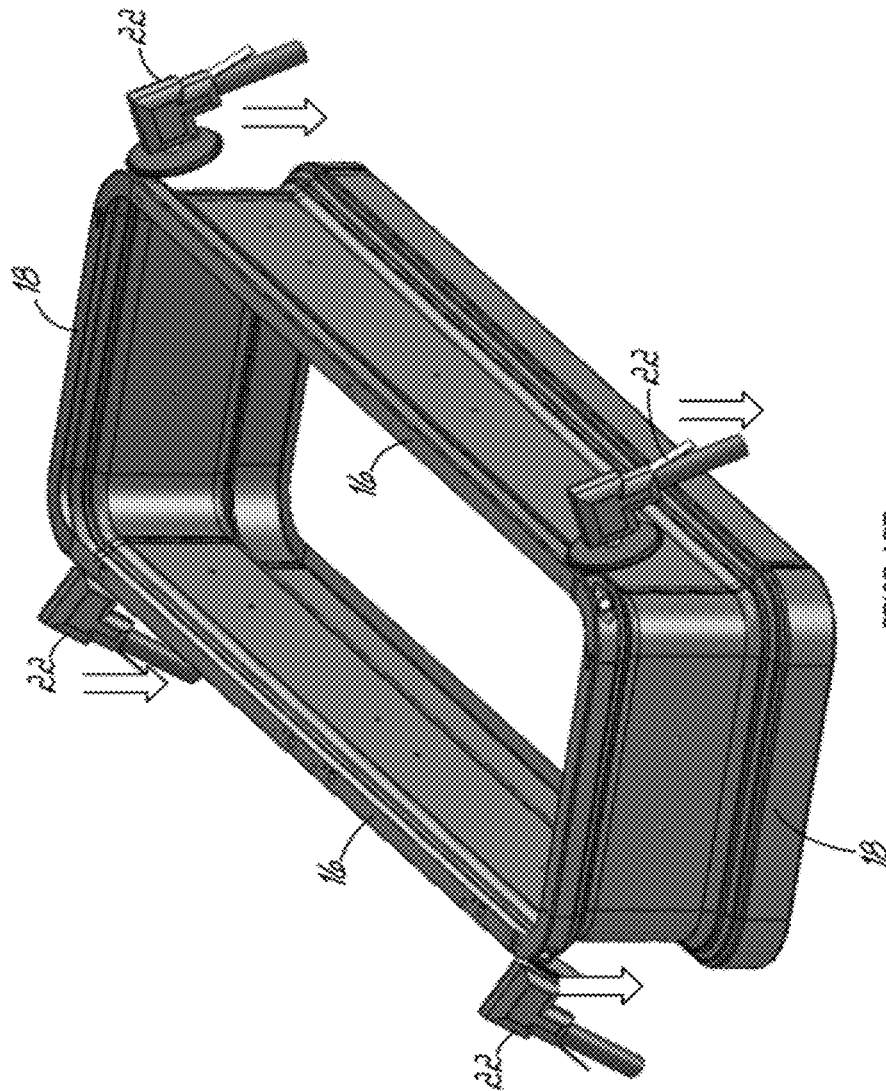


PRIOR ART

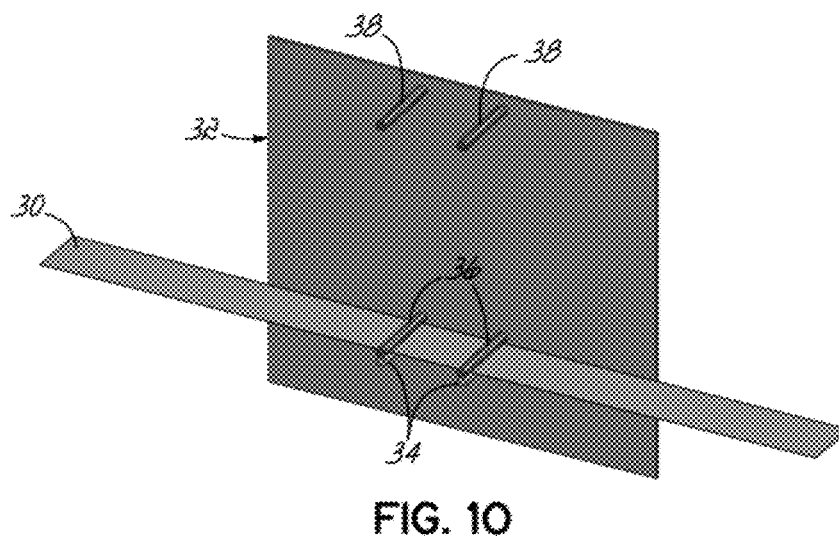
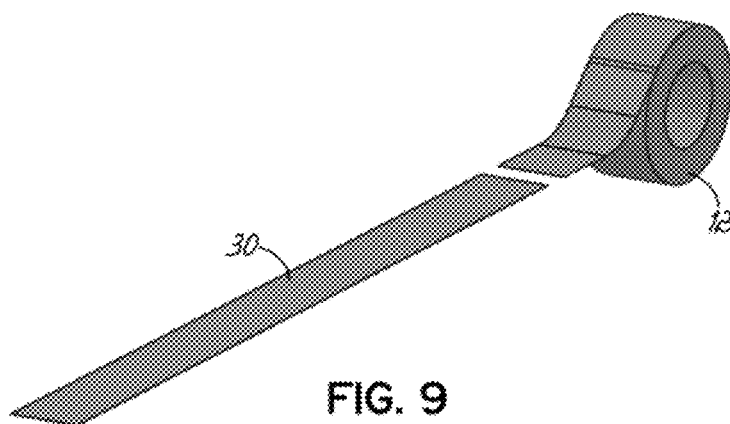
FIG. 6



PRIOR ART
FIG. 7



PRIOR ART
FIG. 8



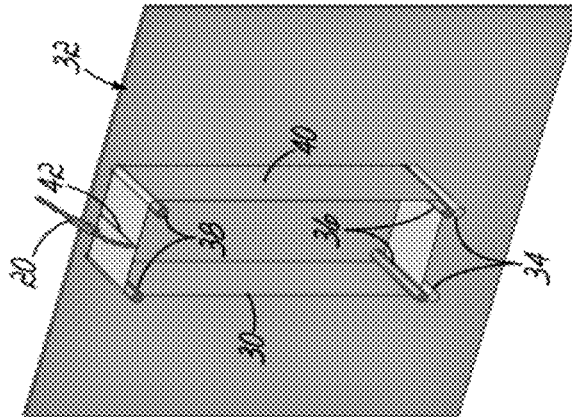


FIG. 13

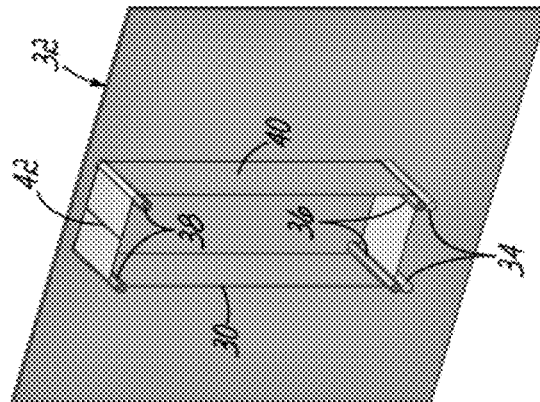


FIG. 12

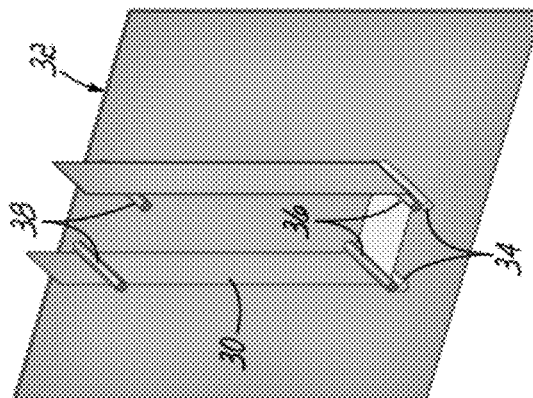


FIG. 11

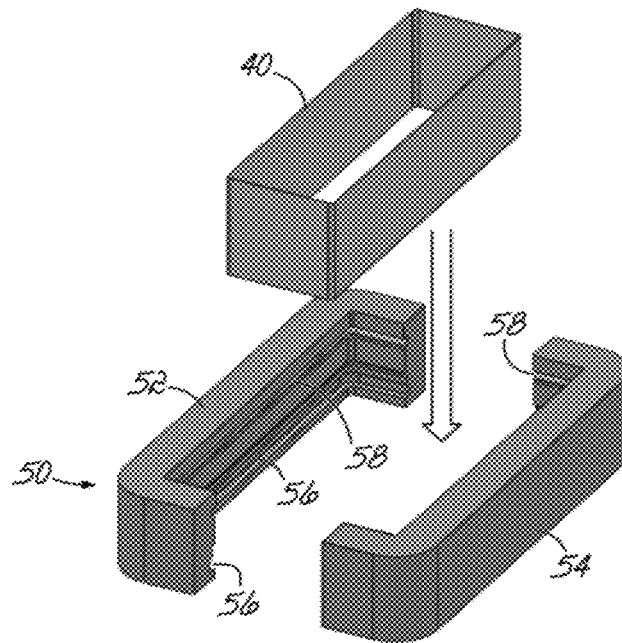


FIG. 14

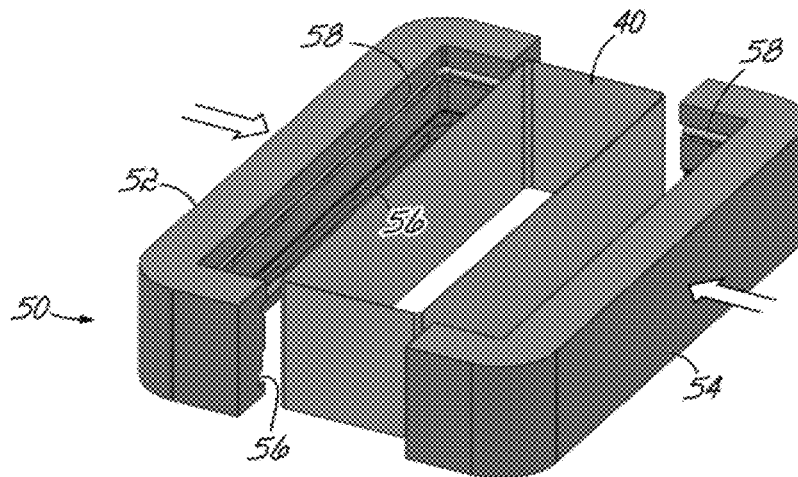


FIG. 15

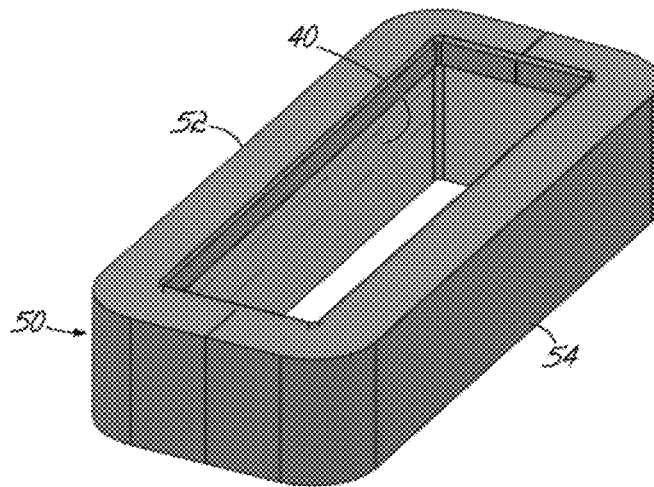


FIG. 16

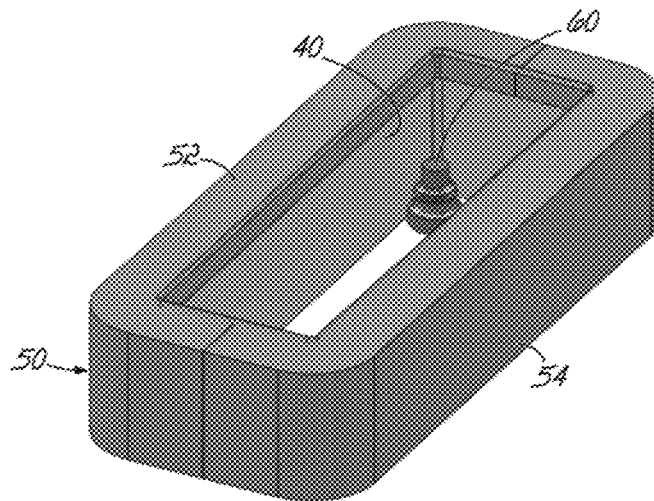


FIG. 17

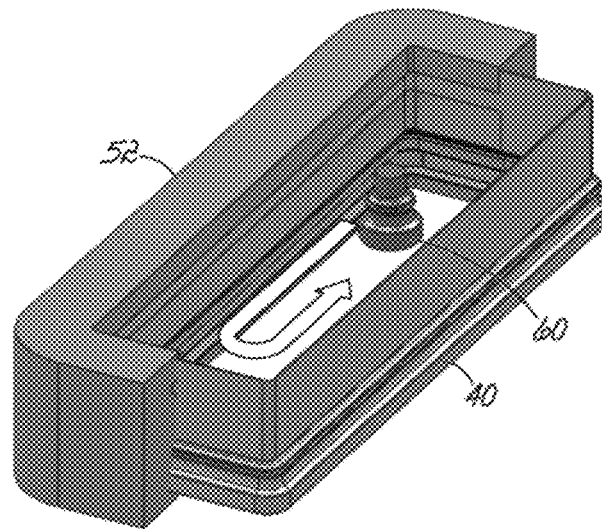


FIG. 18

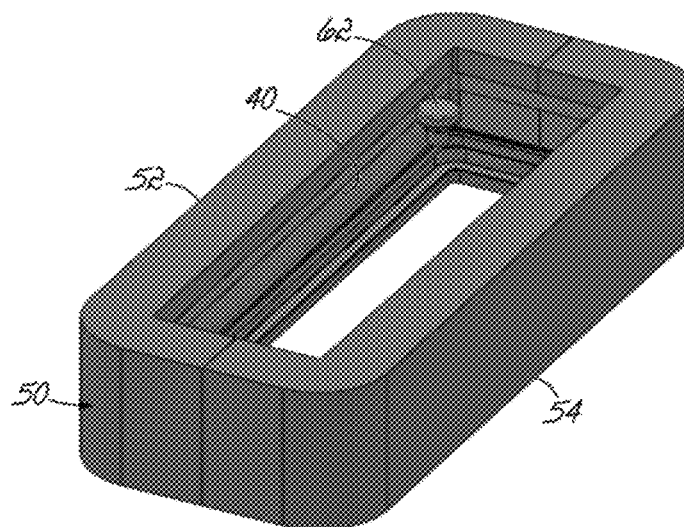


FIG. 19

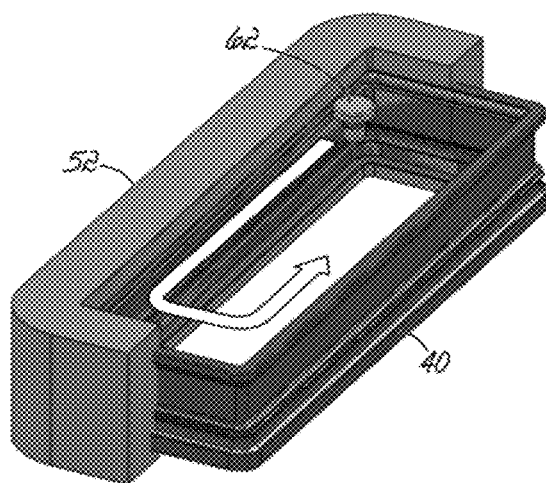


FIG. 20

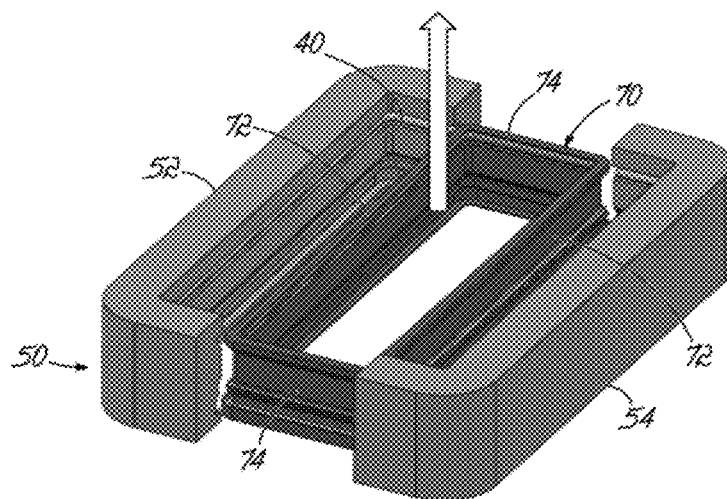


FIG. 21

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METHOD OF FORMING SHEET METAL CASKET SHELL

RELATED APPLICATIONS

N/A

FIELD

The subject matter herein relates generally to caskets, and more particularly to methods of forming sheet metal caskets.

BACKGROUND

Referring to FIGS. 1-8, one commonly employed process currently utilized to form sheet metal casket shells is as follows: Two side panels 10, 10 are blanked from a coil 12 of sheet steel (or other suitable sheet metal), and two end panels 14, 14 are blanked from the coil 12. Next, both side panels 10, 10 and both end panels 14, 14 are stamped to form the desired profile of the shell side walls 16, 16 and end walls 18, 18. Next, the four walls 16, 16, 18, 18 are loaded onto a weld fixture and welded together by welders 20, and finally the four welds are ground smooth with grinders 22. At some point along the way a bottom wall or panel (not shown) is welded to the side walls 16, 16 and the end walls 18, 18.

This current process of forming sheet metal casket shells includes a number of disadvantages. Each panel requires at least one blanking operation along with one or two stamping operations. The sheets must be loaded into a first press to be blanked, and then moved to a second press to be stamped. The panels are then moved to a new location where they are loaded onto a fixture that holds the panels in the correct assembled orientation. Each corner is then welded either manually or robotically. The corners contain intricate profiles which add complexity to the welding operation. The welded shell is then moved to a new location where each weld is manually rough ground. Because of the intricate profiles the grinding must be done at a slower pace to insure that only unwanted weld is removed. The shell is then placed on line where the corners are eventually manually finish sanded. All of these operations are labor intensive, and because of the repeated handling of the parts, the parts are susceptible to dents and dings. The welding operations require energy for the welder and consume welding wire. The grinding and sanding operations require energy, consume numerous sanding discs, and produce dust and debris.

It is desirable to improve upon this current method of forming sheet metal casket shells.

SUMMARY

In one aspect, a method of forming a pair of opposed side walls and a pair of opposed end walls of a sheet metal casket shell from a single piece of sheet metal, the piece of sheet metal having opposite ends and having a length equal to the combined length of the pair of side walls and the pair of end walls of the casket shell to be formed, is provided. The method comprises the steps of securing the opposite ends of the piece of sheet metal together to form a tube, positioning a roll forming roller in an interior of the tube, positioning a female die configured to produce a desired profile for the side walls and the end walls of the casket shell around an exterior of the tube, moving the roller outwardly so as to contact an interior surface of the tube and deform the tube toward a die cavity of the female die, and rolling the roller around a perimeter of the interior of the tube so as to deform the perimeter of

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the tube toward the die cavity of the female die, thereby producing the desired profile for the side walls and the end walls of the casket shell.

The step of securing the opposite ends of the piece of sheet metal together can comprise welding the opposite ends of the piece of sheet metal together. The method can further comprise the step of abutting the opposite ends of the piece of sheet metal before welding the opposite ends of the piece of sheet metal together. The method can further comprise the step of grinding the welded ends of the piece of sheet metal smooth before the steps of moving the roller outwardly into contact with the interior surface of the tube and rolling the roller around an inner circumference of the tube.

The method can further comprise the step of forming the piece of sheet metal into a rectangle before securing the opposite ends of the piece of sheet metal together. The method can further comprise the step of locating the opposite ends of the piece of sheet metal on one of the end walls of the casket shell. For example, the opposite ends of the piece of sheet metal can be located medially of a length of the one end wall of the casket shell.

The female die and the roll forming roller can cooperate to produce a desired base mold profile of the side walls and the end walls of the casket shell. The die cavity of the female die can have a profile substantially the same as the desired base mold profile of the side walls and the end walls of the casket shell.

The female die and the roll forming roller can cooperate to produce a desired top mold profile of the side walls and the end walls of the casket shell. The die cavity of the female die can have a profile substantially the same as the desired top mold profile of the side walls and the end walls of the casket shell.

The female die and the roll forming roller can cooperate to produce a desired base mold profile and a desired top mold profile of the side walls and the end walls of the casket shell. The die cavity of the female die can have a profile substantially the same as the desired base mold profile and the desired top mold profile of the side walls and the end walls of the casket shell.

The method can further comprise the step of severing the piece of sheet metal from a coil of sheet metal prior to the step of securing the opposite ends of the piece of sheet metal together to form the tube.

The steps of moving the roller outwardly to contact an interior surface of the tube and deform the tube toward the die cavity, and rolling the roller around the perimeter of the interior of the tube to deform the perimeter of the tube toward the die cavity, can cause the tube to substantially conform to the profile of the die cavity.

In another aspect, a method of forming a pair of opposed side walls and a pair of opposed end walls of a sheet metal casket shell from a single piece of sheet metal, the piece of sheet metal having opposite ends and having a length equal to the combined length of the pair of side walls and the pair of end walls of the casket shell to be formed, comprises the steps of severing the piece of sheet metal from a coil of sheet metal, forming the piece of sheet metal into a rectangular tube so that the opposite ends of the piece of sheet metal abut, welding the opposite ends of the piece of sheet metal together, grinding the welded ends of the piece of sheet metal smooth, positioning a roll forming roller in an interior of the tube, positioning a female die configured to produce a desired profile for the side walls and the end walls of the casket shell around an exterior of the tube, moving the roller outwardly so as to contact an interior surface of the tube and deform the tube toward a die cavity of the female die, and rolling the roller

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around a perimeter of the interior of the tube so as to deform the perimeter of the tube toward the die cavity of the female die, thereby producing the desired profile for the side walls and the end walls of the casket shell.

Various embodiments of the inventive method thus provide a number of advantages over and above the commonly employed process for forming a sheet metal casket shell described above. For example, only a single sheet of sheet metal must be handled instead of four separate sheets of sheet metal. The welding operation occurs in only one location on a flat surface that can be easily ground and finish sanded. Because the weld is located on a flat surface the grinding and sanding operations can be performed automatically by a machine. The initial forming of the single sheet of sheet metal into the rectangular shape can be performed on a simple brake press, either manually or automatically. All of the profile forming of the shell side walls and end walls can be performed on one machine on the entire shell all at once. The inventive method requires less labor, produces a stronger overall one piece (side walls and end walls) shell, reduces the chances of the shell becoming damaged since less handling is required, requires fewer consumables such as welding wire and sanding discs and consequently consumes less energy, and is cleaner.

DRAWINGS

FIG. 1 is a diagrammatic perspective view of the step of blanking a casket shell side panel from a coil of sheet metal in the prior art method of forming a sheet metal casket shell.

FIG. 2 is a diagrammatic perspective view of the step of stamping the casket shell side panel to form the casket shell side wall in the prior art method of forming a sheet metal casket shell.

FIG. 3 is a diagrammatic perspective view of the step of blanking a casket shell end panel from a coil of sheet metal in the prior art method of forming a sheet metal casket shell.

FIG. 4 is a diagrammatic perspective view of the step of stamping the casket shell end panel to form the casket shell end wall in the prior art method of forming a sheet metal casket shell.

FIGS. 5 and 6 are diagrammatic perspective views of the step of assembling and fixturing the casket shell side walls and ends walls for welding in the prior art method of forming a sheet metal casket shell.

FIG. 7 is a diagrammatic perspective view of the step of welding the casket shell side walls and end walls together in the prior art method of forming a sheet metal casket shell.

FIG. 8 is a diagrammatic perspective view of the step of grinding the four welds smooth in the prior art method of forming a sheet metal casket shell.

FIG. 9 is a diagrammatic perspective view of the step of blanking the casket shell side panels and end panels as a single piece of sheet metal from a coil of sheet metal in the present method of forming a sheet metal casket shell.

FIGS. 10-12 are diagrammatic perspective views of the steps of forming the piece of sheet metal into a rectangular tube in the present method of forming a sheet metal casket shell.

FIG. 13 is a diagrammatic perspective view of the step of welding the abutting opposite ends of the piece of sheet metal together in the present method of forming a sheet metal casket shell.

FIGS. 14-16 are diagrammatic perspective views of the steps of positioning a female die configured to produce a

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desired profile for the casket shell side walls and end walls around the rectangular tube in the present method of forming a sheet metal casket shell.

FIG. 17 is a diagrammatic perspective view of the step of positioning a roll forming roller in a lower position of an interior of the rectangular tube in the present method of forming a sheet metal casket shell.

FIG. 18 is a diagrammatic perspective view of the step of moving the roller outwardly and around a perimeter of the interior of rectangular tube to create the desired base mold profile of the casket shell side and end walls in the present method of forming a sheet metal casket shell.

FIG. 19 is a diagrammatic perspective view of the step of positioning a roll forming roller in an upper position of the interior of the rectangular tube in the present method of forming a sheet metal casket shell.

FIG. 20 is a diagrammatic perspective view of the step of moving the roller outwardly and around a perimeter of the interior of the rectangular tube to create the desired top mold profile of the casket shell side and end walls in the present method of forming a sheet metal casket shell.

FIG. 21 is a diagrammatic perspective view of the step of removing the female die from the formed casket shell side and end walls in the present method of forming a sheet metal casket shell.

DESCRIPTION

Referring to FIG. 9, a single piece of sheet metal 30, having a length equal to the combined length of the casket shell side walls and end walls of the casket shell to be formed, is blanked from the coil 12 of sheet metal.

Referring to FIGS. 10-12, the piece of sheet metal 30 is transferred to a forming machine 32. An exemplary forming machine 32 can have a first pair of posts 34, 34, a second pair of posts 36, 36, and a third pair of posts 38, 38. The piece of sheet metal 30 is slid between the first and second pairs of posts 34, 34 and 36, 36, and is bent upwardly and around third pair of posts 38, 38 to form a rectangular tube 40. The opposite ends of the piece of sheet metal abut at 42.

Referring to FIG. 13, the abutting opposite ends of the piece of sheet metal are welded at 42 with a welder 20. Advantageously, the abutting opposite ends can be located as shown in FIGS. 12 and 13, i.e. medially of one of the casket shell end walls. Such a location provides for convenient grinding and clean up of the weld line.

Referring to FIGS. 14-16, a die 50 is placed around the rectangular tube 40. The die 50 comprises a pair of female dies 52, 54. Each of the female dies 52, 54 includes a base mold profile 56 and a top mold profile 58. The rectangular tube 40 is held in place by internal clamping (not shown for clarity).

Referring to FIG. 17, a roll forming roller 60 is positioned in an interior of the rectangular tube 40 (support structure for roller 60 not shown for clarity). As illustrated, roller 60 is positioned in a lower portion of the tube 40 so as to form the base mold profile of the casket shell side and end walls.

Referring to FIG. 18, roller 60 is moved outwardly so as to contact an interior surface of the tube 40 and deform the tube 40 toward the die cavity 56. Roller 60 is then rolled around a perimeter of the interior of the tube 40 so as to deform the perimeter of the tube 40 toward the die cavity 56 of the female dies 52, 54 (female die 54 not shown for clarity). More than one roller 60 with differing profiles may be required to fully form the base mold of the casket shell side and end walls, and more than one complete pass around the perimeter of the

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interior of the tube **40** may be required to fully form the base mold profile of the casket shell side and end walls.

Referring to FIG. **19**, another roll forming roller **62** is positioned in an interior of the rectangular tube **40** (support structure for roller **62** again not shown for clarity). As illustrated, roller **62** is positioned in an upper portion of the tube **40** so as to form the top mold profile of the casket shell side and end walls.

Referring to FIG. **20**, roller **62** is moved outwardly so as to contact an interior surface of the tube **40** and deform the tube **40** toward the die cavity **58**. Roller **62** is then rolled around a perimeter of the interior of the tube **40** so as to deform the perimeter of the tube **40** toward the die cavity **58** of the female dies **52**, **54** (female die **54** not shown for clarity). More than one roller **62** with differing profiles may be required to fully form the top mold of the casket shell side and end walls, and more than one complete pass around the perimeter of the interior of the tube **40** may be required to fully form the top mold profile of the casket shell side and end walls.

If desired, a single roller could be utilized to simultaneously form the base mold and the top mold, and/or base mold, top mold, and intermediate profile intermediate the base mold and top mold. (Casket shells that have a top mold profile/curvature, bottom mold profile/curvature, and a profile/curvature intermediate the top mold and bottom mold are known as "urn" casket shells, and can be formed by the principles of the present invention.) Or, four rollers could be utilized, one in each corner of the rectangular tube **40**. The four rollers could be simultaneously moved outwardly to create an initial set in the corners of the rectangular tube **40**. Then, three of the rollers could be removed from the interior of the tube **40**, and the remaining roller could be caused to roll around the perimeter of the interior of the tube **40**. One set of four rollers could be utilized to form the base mold profile and another set of four rollers could be utilized to form the top mold profile, or one set of four rollers could be utilized to simultaneously form the base mold and the top mold, and/or base mold, top mold, and intermediate profile intermediate the base mold and top mold. The invention can be practiced by fixing the roller in space and rotating the tube and female dies so as to roll the roller around a perimeter of the interior of the tube, as well as by fixing the tube and female dies in space and rotating the roller so as to roll the roller around a perimeter of the interior of the tube. Both such techniques shall be deemed to be embraced by the phrase "rolling the roller around a perimeter of the interior of the tube."

Referring to FIG. **21**, the female dies **52**, **54** are removed, leaving the fully formed casket shell **70** comprising side walls **72** and end walls **74**. The bottom wall or panel may then be welded to the lower edges of the side walls **72** and end walls **74** as is conventional. In this connection the bottom flange to which the bottom wall is welded could be formed with a separate roller or rollers pushing inwardly, rather than the female die; the top flange (against which the casket lid seats) could also be formed this way.

One roll forming machine that can be used to form the casket shell **70** is the model VBU 1200 available from Lucas of Chiuppano, Italy.

The embodiments shown and described are merely for illustrative purposes only. The drawings and the description are not intended to limit in any way the scope of the claims. Those skilled in the art will appreciate various changes, modifications, and other embodiments. All such changes, modifications and embodiments are deemed to be embraced by the claims. Accordingly, the scope of the right to exclude shall be limited only by the following claims and their equivalents.

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What is claimed is:

1. A method of forming a sheet metal casket shell including forming a pair of opposed side walls and a pair of opposed end walls of the sheet metal casket shell from a single piece of sheet metal, the piece of sheet metal having opposite ends and having a length equal to the combined length of the pair of side walls and the pair of end walls of the casket shell to be formed, the method comprising the steps of:

securing the opposite ends of the piece of sheet metal together to form a tube open on both ends,

positioning a roll forming roller in an interior of the tube, positioning a female die configured to produce a desired profile for the side walls and the end walls of the casket shell around an exterior of the tube,

moving the roller laterally outwardly so as to contact an interior surface of the tube and deform the tube toward a die cavity of the female die, and

rolling the roller around a perimeter of the interior of the tube so as to deform the perimeter of the tube toward the die cavity of the female die,

deformation of the tube occurring due to force exerted on the interior of the tube only in a direction laterally outwardly and normal to a longitudinal axis of the tube, thereby producing the desired profile for the side walls and the end walls of the casket shell, and

subsequently to the above steps, attaching a bottom wall to one end of the tube.

2. The method of claim **1** wherein the step of securing the opposite ends of the piece of sheet metal together comprises welding the opposite ends of the piece of sheet metal together.

3. The method of claim **2** further comprising the step of abutting the opposite ends of the piece of sheet metal before welding the opposite ends of the piece of sheet metal together.

4. The method of claim **3** further comprising the step of grinding the welded ends of the piece of sheet metal smooth before the steps of moving the roller outwardly into contact with the interior surface of the tube and rolling the roller around an inner circumference of the tube.

5. The method of claim **1** further comprising the step of forming the piece of sheet metal into a rectangle before securing the opposite ends of the piece of sheet metal together.

6. The method of claim **5** further comprising the step of locating the opposite ends of the piece of sheet metal on one of the end walls of the casket shell.

7. The method of claim **6** wherein the opposite ends of the piece of sheet metal are located medially of a length of the one end wall of the casket shell.

8. The method of claim **1** wherein the female die and the roll forming roller cooperate to produce a desired base mold profile of the side walls and the end walls of the casket shell.

9. The method of claim **8** wherein the die cavity of the female die has a profile substantially the same as the desired base mold profile of the side walls and the end walls of the casket shell.

10. The method of claim **1** wherein the female die and the roll forming roller cooperate to produce a desired top mold profile of the side walls and the end walls of the casket shell.

11. The method of claim **10** wherein the die cavity of the female die has a profile substantially the same as the desired top mold profile of the side walls and the end walls of the casket shell.

12. The method of claim **1** wherein the female die and the roll forming roller cooperate to produce a desired base mold profile and a desired top mold profile of the side walls and the end walls of the casket shell.

13. The method of claim **12** wherein the die cavity of the female die has a profile substantially the same as the desired

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base mold profile and the desired top mold profile of the side walls and the end walls of the casket shell.

14. The method of claim 1 further comprising the step of severing the piece of sheet metal from a coil of sheet metal prior to the step of securing the opposite ends of the piece of sheet metal together to form the tube.

15. The method of claim 1 wherein the steps of moving the roller outwardly to contact an interior surface of the tube and deform the tube toward the die cavity, and rolling the roller around the perimeter of the interior of the tube to deform the perimeter of the tube toward the die cavity, cause the tube to substantially conform to the profile of the die cavity.

16. A method of forming a sheet metal casket shell including forming a pair of opposed side walls and a pair of opposed end walls of the sheet metal casket shell from a single piece of sheet metal, the piece of sheet metal having opposite ends and having a length equal to the combined length of the pair of side walls and the pair of end walls of the casket shell to be formed, the method comprising the steps of:

severing the piece of sheet metal from a coil of sheet metal, forming the piece of sheet metal into a rectangular tube open on both ends so that the opposite ends of the piece of sheet metal abut,

welding the opposite ends of the piece of sheet metal together,

grinding the welded ends of the piece of sheet metal smooth,

positioning a roll forming roller in an interior of the tube,

positioning a female die configured to produce a desired profile for the side walls and the end walls of the casket shell around an exterior of the tube,

moving the roller laterally outwardly so as to contact an interior surface of the tube and deform the tube toward a die cavity of the female die, and

rolling the roller around a perimeter of the interior of the tube so as to deform the perimeter of the tube toward the die cavity of the female die,

deformation of the tube occurring due to force exerted on the interior of the tube only in a direction laterally and normal to a longitudinal axis of the tube,

thereby producing the desired profile for the side walls and the end walls of the casket shell, and

subsequently to the steps, attaching a bottom wall to one end of the tube.

17. The method of claim 16 further comprising the step of locating the opposite ends of the piece of sheet metal on one of the end walls of the casket shell.

18. The method of claim 17 wherein the opposite ends of the piece of sheet metal are located medially of a length of the one end wall of the casket shell.

19. The method of claim 16 wherein the female die and the roll forming roller cooperate to produce a desired base mold profile of the side walls and the end walls of the casket shell.

20. The method of claim 19 wherein the die cavity of the female die has a profile substantially the same as the desired base mold profile of the side walls and the end walls of the casket shell.

21. The method of claim 16 wherein the female die and the roll forming roller cooperate to produce a desired top mold profile of the side walls and the end walls of the casket shell.

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22. The method of claim 21 wherein the die cavity of the female die has a profile substantially the same as the desired top mold profile of the side walls and the end walls of the casket shell.

23. The method of claim 16 wherein the female die and the roll forming roller cooperate to produce a desired base mold profile and a desired top mold profile of the side walls and the end walls of the casket shell.

24. The method of claim 23 wherein the die cavity of the female die has a profile substantially the same as the desired base mold profile and the desired top mold profile of the side walls and the end walls of the casket shell.

25. The method of claim 16 wherein the steps of moving the roller outwardly to contact an interior surface of the tube and deform the tube toward the die cavity, and rolling the roller around the perimeter of the interior of the tube to deform the perimeter of the tube toward the die cavity, cause the tube to substantially conform to the profile of the die cavity.

26. A method of forming a sheet metal article including forming a side wall of the sheet metal article from a single piece of sheet metal, the piece of sheet metal having opposite ends and having a length equal to the length of the side wall to be formed, the method comprising the steps of:

forming the piece of sheet metal into a rectangular shape, securing the opposite ends of the piece of sheet metal together to form a rectangular tube open on both ends,

positioning a roll forming roller in an interior of the tube,

positioning a female die configured to produce a desired profile for the side wall of the article around an exterior of the tube,

moving the roller laterally outwardly so as to contact an interior surface of the tube and deform the tube toward a die cavity of the female die, and

rolling the roller around a perimeter of the interior of the tube so as to deform the perimeter of the tube toward the die cavity of the female die, thereby producing the desired profile for the side wall of the article,

deformation of the tube occurring due to force exerted on the interior of the tube only in a direction laterally outwardly and normal to a longitudinal axis of the tube, and subsequently to the above steps, attaching a bottom wall to one end of the tube.

27. The method of claim 26 wherein the step of securing the opposite ends of the piece of sheet metal together comprises welding the opposite ends of the piece of sheet metal together.

28. The method of claim 27 further comprising the step of abutting the opposite ends of the piece of sheet metal before welding the opposite ends of the piece of sheet metal together.

29. The method of claim 26 wherein the sheet metal article is a casket shell and wherein the side wall is a pair of opposed longer side walls and a pair of opposed shorter side walls.

30. The method of claim 29 wherein the female die and the roll forming roller cooperate to produce a desired base mold profile and a desired top mold profile of the longer side walls and the shorter side walls of the casket shell.

31. The method of claim 26 further comprising the step of severing the piece of sheet metal from a coil of sheet metal prior to the step of forming the piece of sheet metal into the rectangular shape.

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